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THE EXACT SOLUTION OF THE PLANE ELASTICITY PROBLEM FOR THE SYMMETRIC AIRFOIL CRACKS

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Introduction.

The singularity separation method is used to reduce the plane elasticity problem for loaded surface to a linear system, governing the unknown constants. The mixed problem, stated in this paper, can be regarded as the contact problem when a surface normal traction provides the known vertical component of the boundary displacement. The method is available for the wide class of internal holes, including unconventional cracks introduced in [1-3].

Analysis.

The elasticity first basic problem [4] for an unbounded domain D can be reduced to finding two analytic functions

$$F(z)=\Gamma-\frac{X+iY}{2\pi(1+k)z}+\frac{a}{z^2}+\dots,\ G(z)=\Gamma'+\frac{k(X-iY)}{2\pi(1+k)z}+\frac{a'}{z^2}+\dots,z\in D, \quad (1)$$

Γ and Γ' beeng known ($Im\Gamma'=0$). The boundary condition is

$$F(z)+\overline{F(z)}+e^{-2i\arg z'(t)}[z\overline{F'(z)}+\overline{G(z)}]=T_n(t)-iT_s(t), \quad (2)$$

here $z=z(t), t\in[0,1]$, is the equation of the boundary curve ∂D.